Citation:

Snijder MB, van Dam RM, Stehouwer CD, Hiddink GJ, Heine RJ, Dekker JM. A prospective study of dairy consumption in relation to changes in metabolic risk factors: the Hoorn Study.*Obesity (Silver Spring)*. 2008 Mar;16(3):706-9. Epub 2008 Jan 17.

PubMed ID: 18239556

Study Design:

Prospective Cohort Study

Class:

B - Click here for explanation of classification scheme.

Research Design and Implementation Rating:

POSITIVE: See Research Design and Implementation Criteria Checklist below.

Research Purpose:

The aim of the study was to investigate the prospective association between dairy consumption and changes in weight and metabolic disturbances.

Inclusion Criteria:

- Participants from the Hoorn Study, a population based cohort study of glucose tolerance among white men and women aged 50-75 years
- Informed consent was obtained from all participants, and ethical approval was obtained from the Ethical review Committee of the VU University Medical Center.

Exclusion Criteria:

Those subjects with missing data.

Description of Study Protocol:

Recruitment: Participants from The Hoorn Study, a population-based cohort study of glucose tolerance among 2,484 white men and women aged 50-75 years, which started in 1989 has been described in detail elsewhere.

Design : Prospective cohort study

Blinding used (if applicable): not applicable

Intervention (if applicable): not applicable

Statistical Analysis

- Linear and logistic regression analyses were used performed to investigate the association between dairy intake and 6.4 year change in weight, fat distribution, and metabolic risk factors (glucose, lipids, blood pressure) and the incidence of metabolic syndrome.

Data Collection Summary:

Timing of Measurements

Only at baseline, average food intake was measured. At baseline and at follow-up, participants underwent an extensive physical examination and a blood sample was drawn.

Dependent Variables

- Body Composition measurements: Body mass index (kg/m^2), weight, waist, and waist to hip ratio
- Metabolic variables: biochemical analyses of fasting glucose, post-load glucose, HDL cholesterol, LDL cholesterol, triglycerides, blood pressure

Independent Variables

- Average food intake assessed through 92 item semi-quantitative food-frequency questionnaire, which also included the consumption of dairy products.
- Nutrient intake was calculated using a computerized version of the Dutch food composition table
- For all liquid dairy products, one serving was defined as 150 ml, and for all solid dairy products, one serving was defined as 20 g.
- Total dairy consumption was categorized as low-fat dairy (≤2% fat) or high fat dairy (>2% fat).
- The variable dairy deserts included yoghurt, curds and custards.
- The variable milk included all low fat, skim, and whole yoghurts.

Control Variables

- Age
- Gender
- Lifestyle (smoking, physical activity, alcohol intake) obtained in questionnaire

Description of Actual Data Sample:

Initial N:1513 participants

Attrition (final N): 1124 participants

Age: 50-75 years

Ethnicity: White

Other relevant demographics:

Anthropometrics

Location: Amsterdam, The Netherlands

Summary of Results:

Key Findings

- At baseline, only dietary factors, and smoking, were significantly associated with dairy consumption.
- Linear regression analyses, using the continuous dairy variable as independent variable and the change in body composition or metabolic variables as dependent variables, revealed that baseline dairy composition was not associated with changes body composition or metabolic variables, neither after adjustment for potential confounders.
- Baseline dairy consumption was not associated with changes in fasting and post-load glucose concentrations, serum lipid levels (HDL-cholesterol, LDL-cholesterol, and triglycerides) or blood pressure, nor with the risk of developing the metabolic syndrome in 6.4 years (odds ratio of 0.86, 95% confidence interval: 0.52 - 1.42, comparing highest with lowest quartile of dairy consumption).
- In subjects with BMI < 25 kg/m^2, higher dairy consumption was significantly associated with an increase in

BMI, weight, waist, and a decrease in high density lipoprotein.

Associates (β± s.e.) of total dairy consumption (servings/day) with change in body composition and changes in metabolic variables (change is calculated as follow-up minus baseline).

	Model 1 (β± s.e.)	P	Model 2 (β± s.e.)	P	Model 3 (β± s.e.)	P	Model 4 (β± s.e.)	P
Body Composition								
ΔBMI	0.003±0.025	0.898	0.032±0.027	0.238	0.035±0.027	0.201	0.028±0.028	0.316
Δ Weight	-0.008±0.073	0.914	0.089±0.081	0.273	0.094±0.081	0.247	0.074±0.082	0.372
Δ Waist	0.025±0.088	0.776	0.130±0.098	0.186	0.143±0.097	0.139	0.165±0.098	0.093
ΔWHR	0.001±0.001	0.251	0.001±0.001	0.101	0.001±0.001	0.144	0.001±0.001	0.058
Metabolic Variables								
Δ Fasting glucose	0.012±0.011	0.256	0.015±0.012	0.205	0.021±0.011	0.053	0.026±0.011	0.021
Δ Post-load glucose	0.004±0.027	0.872	0.001±0.030	0.970	0.005±0.028	0.858	0.001±0.028	0.973
ΔHDL	-0.002±0.003	0.487	-0.004±0.004	0.278	-0.004±0.003	0.258	-0.003±0.003	0.464
ΔLDL	0.017±0.013	0.169	0.021±0.009	0.132	0.014±0.012	0.219	0.010±0.012	0.386
ΔTG	0.000±0.008	0.964	0.024±0.156	0.959	-0.004±0.008	0.649	-0.003±0.009	0.756

Author Conclusion:

In conclusion, our results do not support the hypothesis that a higher dairy consumption protects against weight gain and development of metabolic disturbances in a Dutch elderly population.

Reviewer Comments:

Dairy consumption was investigated only at baseline and not at follow-up. Although it cannot be assumed, the older population may be less likely to change nutritional habits. The population investigated was relatively healthy.

Research Design and Implementation Criteria Checklist: Primary Research

Relevance Questions

1.	Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies)	Yes
2.	Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?	Yes
3.	Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice?	Yes
4.	Is the intervention or procedure feasible? (NA for some epidemiological studies)	Yes

Validity Questions

1.	**Was the research question clearly stated?**	Yes

1.1.	Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified?	Yes
1.2.	Was (were) the outcome(s) [dependent variable(s)] clearly indicated?	Yes
1.3.	Were the target population and setting specified?	Yes
2.	**Was the selection of study subjects/patients free from bias?**	Yes
2.1.	Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	Yes
2.2.	Were criteria applied equally to all study groups?	Yes
2.3.	Were health, demographics, and other characteristics of subjects described?	Yes
2.4.	Were the subjects/patients a representative sample of the relevant population?	???
3.	**Were study groups comparable?**	Yes
3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	N/A
3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	Yes
3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	N/A
3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	Yes
3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	N/A
3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
4.	**Was method of handling withdrawals described?**	Yes
4.1.	Were follow-up methods described and the same for all groups?	Yes
4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	N/A
4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	Yes
4.4.	Were reasons for withdrawals similar across groups?	N/A
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A
5.	**Was blinding used to prevent introduction of bias?**	Yes
5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	N/A
5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	Yes

5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	Yes
5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	N/A
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A
6.	**Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were interveningfactors described?**	Yes
6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	N/A
6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	Yes
6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	Yes
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	N/A
6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	N/A
6.6.	Were extra or unplanned treatments described?	N/A
6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	N/A
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A
7.	**Were outcomes clearly defined and the measurements valid and reliable?**	Yes
7.1.	Were primary and secondary endpoints described and relevant to the question?	???
7.2.	Were nutrition measures appropriate to question and outcomes of concern?	Yes
7.3.	Was the period of follow-up long enough for important outcome(s) to occur?	Yes
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	Yes
7.5.	Was the measurement of effect at an appropriate level of precision?	Yes
7.6.	Were other factors accounted for (measured) that could affect outcomes?	Yes
7.7.	Were the measurements conducted consistently across groups?	N/A
8.	**Was the statistical analysis appropriate for the study design and type of outcome indicators?**	Yes
8.1.	Were statistical analyses adequately described and the results reported appropriately?	Yes
8.2.	Were correct statistical tests used and assumptions of test not violated?	Yes
8.3.	Were statistics reported with levels of significance and/or confidence intervals?	Yes
8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	N/A
8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	Yes

	8.6.	Was clinical significance as well as statistical significance reported?	Yes
	8.7.	If negative findings, was a power calculation reported to address type 2 error?	N/A
9.	**Are conclusions supported by results with biases and limitations taken into consideration?**		Yes
	9.1.	Is there a discussion of findings?	Yes
	9.2.	Are biases and study limitations identified and discussed?	Yes
10.	**Is bias due to study's funding or sponsorship unlikely?**		Yes
	10.1.	Were sources of funding and investigators' affiliations described?	Yes
	10.2.	Was the study free from apparent conflict of interest?	Yes